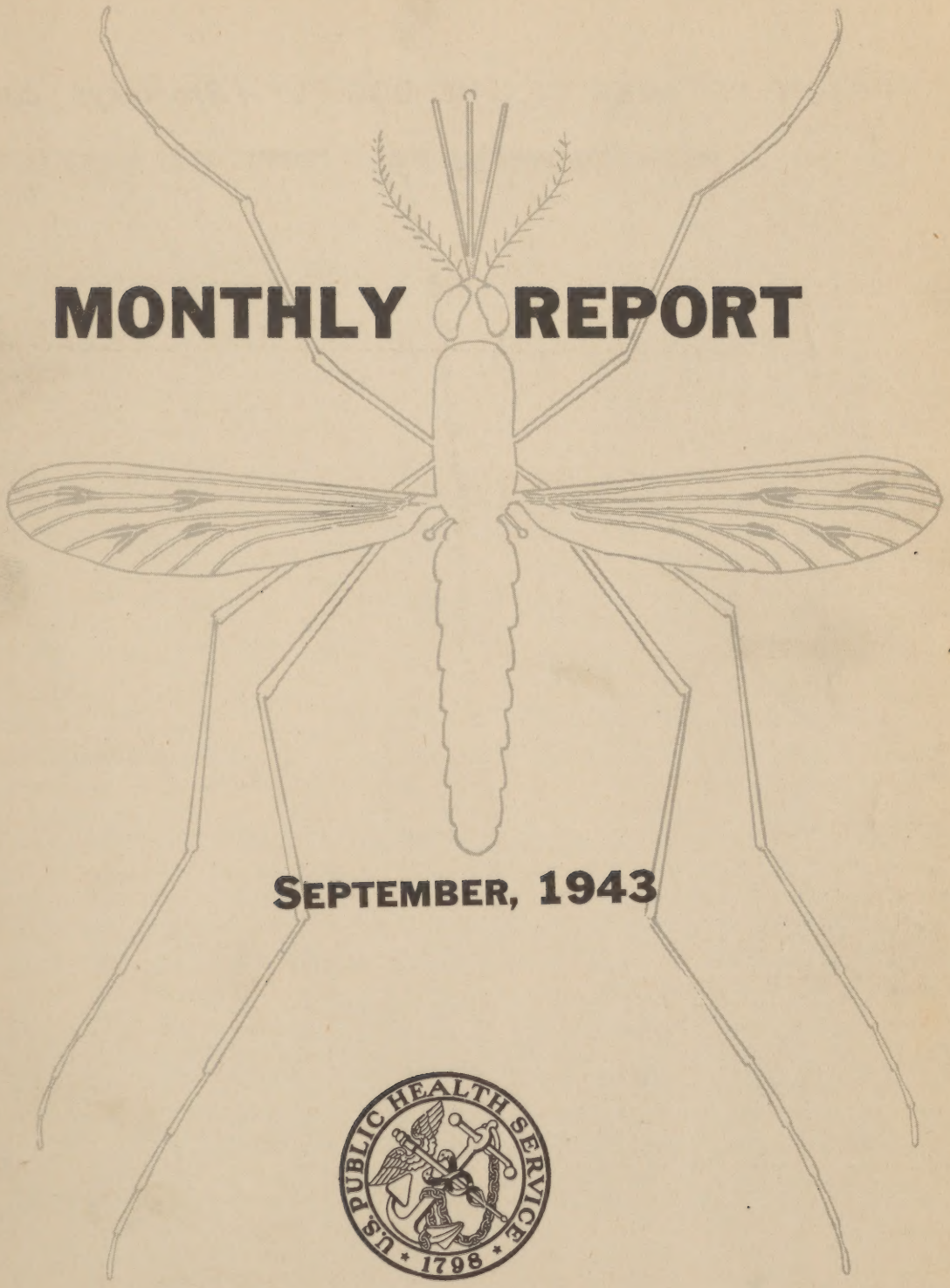
MALARIA CONTROL IN WAR AREAS



MONTHLY REPORT

SEPTEMBER, 1943

FEDERAL SECURITY AGENCY
U. S. PUBLIC HEALTH SERVICE
ATLANTA, GEORGIA

TABLE I — MCWA LARVICIDE AND MINOR DRAINAGE PROJECTS — SEPTEMBER 1 - 30, 1943

STATE	Areas in Operation	War Establishments Protected	LARVICIDAL WORK: Larvicide Used: Oil Gals.	Larvicide Used: Paris Green Lbs.	Surfaces Treated: Acres	OTHER WORK: Ditching: Cu.Yds.	Ditching: Lin.Ft.	Cleaning: Lin.Ft.	Clearing: Acres	Water Surf. Eliminated: Acres	Total Man Hours	Total Men Employed
Alabama	8	64	1,095	33	75.2	518	2,128	34,870	12.2	2.1	6,503	44
Arkansas	14	63	17,879	821	1,587.4	795	13,722	180,824	70.8	5.0	27,576	160
California**	3	11	4,026	---	328.6	*	8,378	---	2.2	29.1	2,000	21
D. C.	1	23	200	8	15.3	455	3,433	2,835	0.9	0.7	2,896	18
Florida	17	91	6,643	99	563.5	8,152	68,842	365,217	45.4	63.5	40,886	209
Georgia	14	93	121	3,101	2,996.2	448	4,688	191,233	28.2	15.7	26,528	133
Illinois	2	54	4,459	3,414	3,536.0	63	320	6,150	0.6	1.0	7,048	33
Indiana	1	40	620	42	275.9	---	---	---	0.8	---	1,621	8
Kentucky	4	48	597	59	86.2	319	1,750	34,780	7.9	0.5	6,054	32
Louisiana	8	71	89,971	2,425	7,445.2	572	14,934	87,056	79.9	6.1	65,448	379
Maryland	2	21	162	16	20.2	966	2,500	23,600	3.3	3.9	4,876	17
Michigan	1	--	---	20	21.5	---	---	---	---	---	145	2
Mississippi	12	50	8,915	96	390.5	357	5,315	204,161	85.1	0.5	18,839	109
Missouri	6	24	5,465	2,119	1,355.6	547	1,380	39,250	6.9	26.7	11,541	55
No. Carolina	10	69	10,446	77	604.7	608	4,578	496,636	146.9	1.2	36,463	179
Oklahoma	5	21	5,782	140	499.7	---	665	106,525	13.4	---	7,808	40
Puerto Rico	6	22	1,325	7,376	11,594.0	*	23,100	104,338	23.7	8.0	64,358	410
So. Carolina	19	101	13,275	851	1,545.1	1,463	15,687	315,957	362.3	7.8	51,023	260
Tennessee	7	69	20,742	203	959.7	366	4,624	18,577	26.1	0.4	13,690	71
Texas	14	119	11,832	179	725.3	1,247	15,540	478,706	151.7	29.2	45,041	231
Virginia	4	83	6,796	197	412.0	*	39,886	13,338	47.2	---	24,657	148
Total	158	1,137	210,349	21,276	35,036.8	16,876	229,470	2,704,053	1,115.5	201.4	465,001	2,559
August Total	157	1,158	241,399	23,465	30,041.1	15,804	311,174	2,658,479	1,030.1	238.0	497,804	2,654

* Figures not available
** Figures shown are for two weeks.

TABLE II — MCWA MAJOR DRAINAGE PROJECTS

STATE	No. of Projects	Clearing Brushing Acres	Channel or Ditch Cleaning Lin.Ft.	New Ditching: Hand	New Ditching: Lin.Ft. Mach.	New Ditching: Dynamite	New Ditching: Total Cu.Yds.	Fill Cu.Yds.	Ditch Lining Placed: Sq.Ft.	Ditch Lining Placed: Lin.Ft.	Underground Drains Lin.Ft.	Water Surf. Eliminated Acres	Total Man Hours
Alabama	2	7.0	12,200	825	---	---	507	---	---	---	---	---	4,789
Arkansas	1	---	---	---	1,660	---	12,499	---	---	---	---	---	668
Florida	1	1.3	2,600	---	---	1,800	5,500	---	---	---	---	---	1,303
North Carolina	4	12.8	5,865	16,031	1,290	---	6,281	62	---	---	30	10.7	11,401
Puerto Rico	3	8.8	900	2,525	---	---	4,599	297	2,535	---	---	---	45,652
South Carolina		6.6	2,700	---	900	---	1,616	75	1,200	800	---	---	1,694
Texas	1	0.5	---	2,497	---	---	405	---	---	---	---	5.3	2,108
Virginia	1	0.4	6,056	129	---	---	36	---	2,814	---	---	---	3,130
Total	13	37.4	30,321	22,007	3,850	1,800	31,443	434	6,549	800	30	16.0	70,745
August Total	15	55.9	51,334	22,336	3,000	15,975	26,977	562	3,074	2,933	---	503.0	66,584

TABLE III — MCWA PERSONNEL ON DUTY ON SEPTEMBER 30, 1943 AND TOTAL PAYROLL FOR MONTH OF SEPTEMBER — SEPTEMBER 1 - 30, 1943

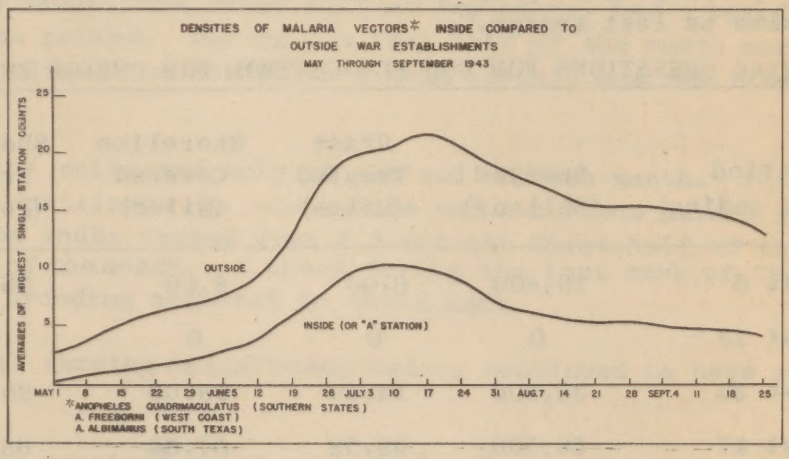
STATE	Commissioned: No.	Commissioned: Pay	Prof. & Sci.: No.	Prof. & Sci.: Pay	Sub-Prof. (1): No.	Sub-Prof. (1): Pay	C. A. F.: No.	C. A. F.: Pay	Custodial: No.	Custodial: Pay	Total: No.	Total: Pay	Percent of Total: No.	Percent of Total: Pay
Alabama	4	1,021	2	659	2	365	2	410	53	6,716	63	9,171	1.8	2.0
Arkansas	5	1,435	2	633	24	4,796	5	411	126	16,635	162	23,910	4.7	5.2
California*														
D. C.	1	332	1	319	3	550	2	367	13	1,879	20	3,447	0.6	0.8
Florida	5	1,533	7	1,880	45	9,453	5	1,088	230	29,639	292	43,593	8.4	9.6
Georgia	3	851	4	654	36	5,885	7	1,376	93	11,708	143	20,474	4.1	4.5
Illinois	3	690	5	1,146	2	416	4	696	27	4,391	41	7,339	1.2	1.7
Indiana	1	284	--	---	1	183	--	---	7	920	9	1,387	0.1	0.3
Kentucky	2	690	4	1,110	5	1,495	3	556	23	3,171	37	7,022	1.1	1.6
Louisiana	9	2,529	6	2,160	42	9,766	6	1,147	336	43,913	399	59,515	11.5	13.0
Maryland	--	---	--	---	3	537	2	410	18	2,463	23	3,410	0.7	0.7
Mississippi	4	1,183	1	264	15	3,068	3	410	88	11,614	111	16,539	3.2	3.6
Missouri	2	567	1	264	13	2,393	4	726	42	5,627	62	9,577	1.8	2.1
No. Carolina	6	1,710	8	1,226	10	1,753	3	287	242	31,689	269	36,665	7.8	8.0
Oklahoma	3	918	4	1,049	7	1,343	1	146	33	4,439	48	7,895	1.4	1.7
Puerto Rico	6	2,007	--	---	11	2,072	5	951	710	31,613	732	36,643	21.1	8.0
So. Carolina	4	1,070	5	1,347	25	6,293	6	870	272	34,330	312	43,910	9.0	9.6
Tennessee	4	1,135	2	477	7	1,592	2	410	63	8,143	78	11,757	2.2	2.6
Texas	7	1,950	6	1,798	30	6,252	4	738	217	29,187	264	39,825	7.6	8.8
Virginia	2	567	2	689	11	2,468	2	559	158	19,554	175	23,837	5.0	5.2
AEDES AEGYPTI														
Florida	--	---	--	---	2	222	1	102	--	121	3	445	0.1	0.1
Georgia	--	---	1	319	11	2,133	1	164	--	---	13	2,616	0.4	0.6
Louisiana	--	---	--	---	20	1,800	1	73	--	---	21	1,873	0.6	0.4
So. Carolina	1	284	--	---	--	1,005	--	73	--	125	1	1,487	0.1	0.3
Texas	2	567	1	148	9	1,750	1	146	21	3,380	34	5,991	1.0	1.3
H.Q. & Dist. (2)	44	13,185	11	3,304	14	6,019	79	13,926	10	1,135	158	37,569	4.5	8.3
Total	118	34,508	73	19,446	348	73,609	149	26,042	2,782	302,392	3,470	455,997	100.0	100.0
Percent of Total	3.4	7.6	2.1	4.3	10.0	16.1	4.3	5.7	80.2	66.3	100.0	100.0		

* Figures not available
(1) Includes Entomological Inspectors
(2) Includes Headquarters and District Offices, malaria survey, special investigations and employees temporarily attached to Headquarters pending assignment to States.

MONTHLY REPORT
MALARIA CONTROL IN WAR AREAS
SEPTEMBER, 1943

QUAD DENSITIES CONTINUE DECREASE

The decrease in *Anopheles quadrimaculatus* prevalence, which began in late July, continued generally through September. This is shown graphically by the accompanying chart. Drought and the advent of cooler weather tended to diminish breeding in some of the areas; in others the pooling of streams and the stabilization of pond and lake surfaces have increased the control problem. Entomological reports (M-7) received during the month show that in a total of 480 or 92 percent of the zones, *quadrimaculatus* densities were satisfactorily low. This compares with 91 percent in this category during August. The number of satisfactory zones had increased to 94 percent by the last week in September. Inspectional and control work was discontinued in several of the more northerly zones during the month.



Cooperation with Army

The status of malaria vectors in the vicinity of a large number of Army general hospitals and prisoner of war camps was reported to the Army authorities during September. By means of a condensed reporting system, reports on changing conditions will be made periodically. Preliminary work to determine the abundance of malaria vectors around these general hospitals and prisoner of war camps not yet surveyed is continuing. Because of the advanced season further observations next year will be necessary before reliable data can be obtained on these.

Exotic Disease Vectors

With the danger of exotic disease vectors entering the United States becoming more real with the ever-increasing air travel from foreign countries, it is planned to keep a close watch over the more important ports of entry. Four additional entomologists are being trained for this work at the U. S. Public Health Service Quarantine Station at Miami, Florida. Upon completion of their training these men will be assigned to duty at selected ports of entry.

DOG FLY CONTROL MEASURES RESUMED

For the third successive season, the U. S. Public Health Service, operating jointly with the Department of Agriculture, Bureau of Entomology and Plant

Quarantine, is conducting a program for the control of the dog fly pest at Panama City, Florida. Designed to protect military installations and war activities in northwestern Florida, this program has made possible uninterrupted training and war production in areas along the Gulf Coast infested by the pest.

The following tabular account of dog fly operations was submitted by Dr. S. W. Simmons, entomologist, who is in charge of the project. The spraying shown for the period ending August 6 was of a preliminary nature, during which improvements in equipment and procedures were adopted. Actual control spraying was initiated during the week ending August 20th. Except during the preliminary work, the spray used consisted of 25 percent creosote in bay water, the same as last season.

SPRAYING OPERATIONS FOR DOG FLY CONTROL FOR PERIOD ENDING SEPTEMBER 10, 1943

Period (Week ending)	Sprayed (Gallons)	Grass Treated (Miles)	Shoreline Covered (Miles)	Shoreline Treated (Percent)	Material used per mile of grass treated (Gallons)
August 6	10,400	6.00	8.00	75.00	1733.2
August 13	0	0	0	0	0
August 20	35,200	14.40	18.00	80.00	2444.64
August 27	69,500	39.58	57.50	68.83	1755.37
September 3	105,900	38.12	57.75	66.00	2778.26
September 10	100,750	26.73	43.57	61.35	3769.46
Totals and Averages	321,750	124.83	184.82	67.54	2577.63

Ten spray units were in operation during August in the area from Pensacola to Port St. Joe. Other units were in readiness for initiation of work in the Apalachicola area as soon as needed. No grass deposits, the breeding medium used by the flies, had appeared on the shore in this area by September 10th.

During the period covered by the report no large outbreaks of flies occurred. During optimum conditions, minor infestations were observed in a few localities, as is usual. It was concluded that the program has been entirely satisfactory to date.

AEGYPTI INDEX SHOWS RISE

As has been expected, the *Aedes aegypti* index for most of the projects showed a marked increase for September as the breeding season approached its climax.

A notable exception was Savannah, Georgia, which had an index of 10.5 for the last half of the month to continue its record of a constant decrease every semi-monthly period since July.

The Miami, Florida project continued to show an index of approximately 6.0.

Key West, Florida, operating on a greatly reduced scale during the last two weeks of September, had an index of 4.3 for the first half of the month and 6.8 for the last half.

Heavy rainfall in Louisiana and Texas occurring at a time when breeding is normally increasing, gave further impetus to the rising index. New Orleans, which had a subnormal rainfall during the first half of September, had a breeding index of 6.0 for the same period. During the last half of the month more than 12 inches of rain fell, almost ten inches more than normal, and the index for the period rose to 8.9.

In Houston, tin cans are collected only at the end of each month. This allows large piles of these containers to accumulate and a serious hazard as is shown by the fact that the index jumped from 2.6 for the first half of the month, to 7.1 for the last half of the month. A check during the last week of the month showed that 30% of the breeding occurred in these cans.

Corpus Christi, although showing an increased index, continued to have an incidence of less than 1%.

All other Texas projects remained below the 5% level except San Antonio which jumped to 6.6% for the period September 16-30.

The Charleston index for the month was less than 2.5%.

TABLE IV

MCWA ENCUMBRANCES AND LIQUIDATIONS BY MAJOR ITEMS

SEPTEMBER 1943

	Continental U.S.	Puerto Rico
.01 Personal Services	$424,348	$36,642
.02 Travel	18,900	150
.03 Transportation	1,500	-------
.04 Communications Service	1,242	25
.05 Rent	2,060	-------
.06 Printing and Binding	450	-------
.07 Other Contractual Services	19,941	1
.08 Supplies and Materials	34,838	4,156
.09 Equipment	10,256	30
Sub-total other than Personal Services	89,187	4,362
Total	513,535	41,004

ARKANSAS PROJECT ILLUSTRATES DRAINAGE ECONOMIES

Permanent elimination of breeding areas by drainage has long been recognized as sound procedure by MCWA. Drainage undertaken at this time which will eliminate future larviciding is particularly desirable in view of possible further decreases of manpower which seems imminent and which might at some future date make larviciding operations impossible in certain areas. In many instances drainage also has achieved more extensive control and despite its higher initial cost, proved more economical over a given period.

An outstanding example of this type project was the drainage of Round Pond which is located within flight range of Newport, Arkansas. This pond is a 200 acre circular swamp south of the city limits. Trees, vegetation, and debris had made larviciding difficult. At the beginning of the breeding season *Anopheles quadrimaculatus* mosquitoes were found throughout all of south Newport with one adult index station showing a count of 89 quads. The pond was consequently larvicided with Paris green from a power duster mounted on a motor boat. A heavy application was laid down and fair larval control was obtained for the first week; however, by this time the water lever had dropped to such a point that a motor boat no longer could navigate the area because of trees and stumps. It was then decided to apply Paris green by airplane. Four applications were applied with effective control being achieved in only one instance. The area is not adaptable to airplane dusting because of the height of the trees which necessitates flying at an elevation of approximately 80 feet. At this elevation a very low wind velocity must prevail in order to obtain proper coverage. During the three weeks of ineffective control by airplane dusting, supplemental dusting was done using hand dusters. Such portions of the swamp as could be reached were dusted but with the water hip deep difficulties in wading made only partial control possible.

Estimated Cost of Larviciding for Season: The cost of the above larviciding from which effective control was not obtained, covering a period of approximately five weeks, was $1,033.00. The acreage that would have remained covered with water during the remainder of the season is not definitely known, but it is estimated that it would have been necessary to larvicide approximately 60 acres of water during the remainder of the season. The cost of such larviciding for the season follows:

Labor....60 acres @ 4 M.H. per acre = 240 M.H. at 70¢	=	$168.00
Paris green...60 acres @ 1 lb. per acre = 60# @ 20¢	=	12.00
Lime....60 acres @ 8 lbs. per acre = 480# @ 3/4¢	=	3.60
TOTAL		$183.60

20 applications @ $183.60 =	$3672.00
Five weeks actual cost (by plane and hand)	1033.00
Estimated cost for season	$4705.00

In view of the fact that the results obtained from such a program would not justify the cost, it was decided to drain the area by using dynamite. In eight days 18,650 feet of drainage ditch had been constructed. This ditch had a cross-section three feet deep with a three foot bottom and a ten foot top. Seventeen thousand pounds of dynamite were used and the total cost of the project including labor and material was $3,112.00. At a later date the ditch will be dressed, which will include the removal of the remaining roots and stumps. This additional cost is estimated at $562.00, which will give a completed cost of $3,674.00.

At the completion of this work, all water remaining in Round Pond was confined to the drainage ditch which can be larvicided without difficulty. It will be necessary to larvicide for a period of five weeks each spring during which the area is covered by flood waters. The cost of this is estimated at $1,033.00. This figure should be added to the cost of drainage work in order that a fair comparison may be made between the cost of larviciding and drainage. The following shows this comparative cost, in which it is estimated that the cost for drainage plus five weeks of larviciding would be approximately the same as for larviciding for a period of 25 weeks. The drainage ditch, however, with a small amount of maintenance will provide adequate control over a period of several years, and consequently will prove not only more effective but also more economical.

Cost of Drainage

17,000 lbs. of dynamite @ $12.50 per cwt		$2,137.00
Labor:		
Clear right-of-way	$495.00	
Load and shoot	480.00	
Remove roots, etc.	562.00	
Total labor	$1,537.00	1,537.00
Larviciding, necessary because of flood conditions		1,033.00
TOTAL		$4,707.00

Cost of Larviciding

Actual cost for five weeks including airplane cost, larvicide and labor	$1,033.00
20 applications by hand @ $183.60	3,672.00
TOTAL	$4,705.00

(From a report suggested by Porter A. Stephens and compiled by John E. Taylor)

MCWA AIRPLANE DUSTING PROGRAM

SEPTEMBER 1 - 30, 1943

STATE	NO. OF AREAS DUSTED	ACREAGE DUSTED	PARIS GREEN USED LBS.	DILUENT USED LBS.	PARIS GREEN PER ACRE	DUSTING TIME HOURS	TOTAL MAN HOURS
Arkansas	2	2,325	1,745	8,370	0.7	11:22	224
Louisiana	3	3,200	6,800	14,600	2.1	9:04	504
Potomac River	1	4,450	6,565	21,995	1.4	35:29	1,432
TOTAL	6	9,975	15,110	44,965	1.5	55:55	2,160

MALARIA MORTALITY IN THE UNITED STATES, 1935 - 1942

Since 1936 there has been an uninterrupted decrease in the number of reported malaria deaths in the United States. For the 15 States listed in the table below, the total number of deaths reported as the result of malaria dropped from 4,345 in 1935 to 808 in 1942.

AVERAGE ANNUAL CRUDE MALARIA DEATH RATE PER 100,000 POPULATION AND PER CENT OF COUNTIES HAVING CRUDE MALARIA DEATH RATE OVER 30 IN 15 STATES, 1938 - 1942

STATE	AVERAGE ANNUAL MALARIA DEATH RATE 1935 - 1942	PER CENT OF COUNTIES HAVING AVERAGE ANNUAL MALARIA DEATH RATE OVER 30	
		1935-1939	1938-1942
15 States	4.7	6.3	1.0
Arkansas	15.8	23.9	1.3
South Carolina	12.5	28.2	8.7
Mississippi	12.0	9.8	1.2
Florida	9.4	28.4	6.0
Alabama	7.7	4.5	3.0
Georgia	7.3	11.3	0.6
Louisiana	7.1	3.1	0.0
Texas	4.6	2.8	0.4
Tennessee	3.6	2.1	0.0
Oklahoma	3.0	1.3	0.0
North Carolina	2.1	1.0	0.0
Missouri	2.0	3.5	0.0
Kentucky	1.2	0.0	0.0
Illinois	0.4	0.0	0.0
Virginia	0.3	0.0	0.0

In no State is the malaria problem even approximately equal in all counties. In fact it is rarely uniform throughout an individual county. This is one of the reasons why State death rates alone are inadequate descriptions of the malaria problem. It would be desirable to use geographic areas considerably smaller than most counties in evaluating the malaria mortality and morbidity hazard, but the data required for such a study are usually not available. Statistics based on county populations are easily obtained.

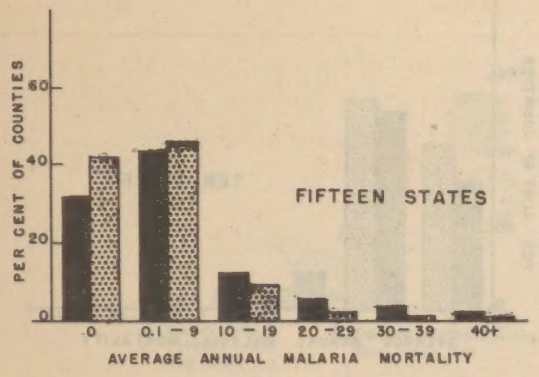
The graphs on succeeding pages illustrate distribution of counties in each of 15 States and for the 15 States combined according to average annual reported malaria mortality for the two 5-year periods 1935-1939 and 1938-1942. Five-year periods were used to lend stability to the computed averages. The 16 graphs are comparable with each other because the height of the bars was made to represent percentage of counties in any mortality category rather than number of counties.

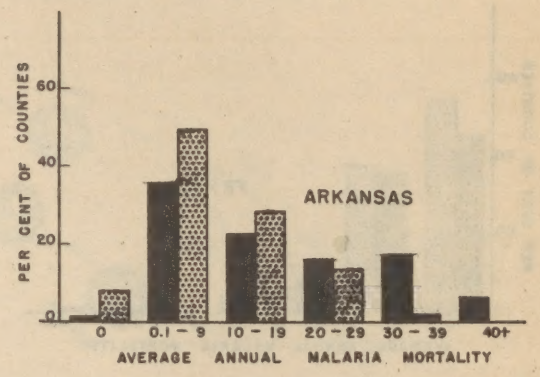
It is interesting to note that although Mississippi had a smaller percentage of counties with no malaria deaths than any other State (none in 1935-1939 and 3.7% in 1938-1942) it ranks only third on the basis of average annual death rates for the period 1935-1942. There were relatively few Mississippi counties with average annual death rates over 30.

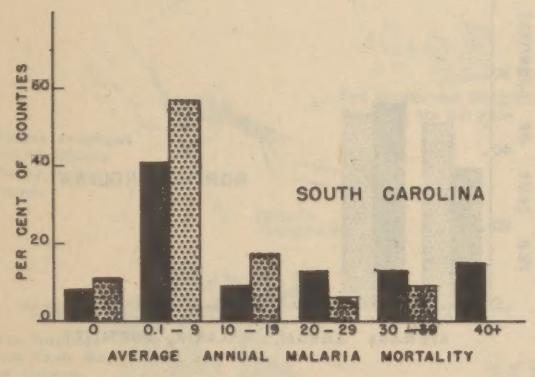
Each graph shows a significant change in distribution of counties in 1938-1942 as compared with 1935-1939. This reflects the reduction in malaria deaths that has been observed during this period.

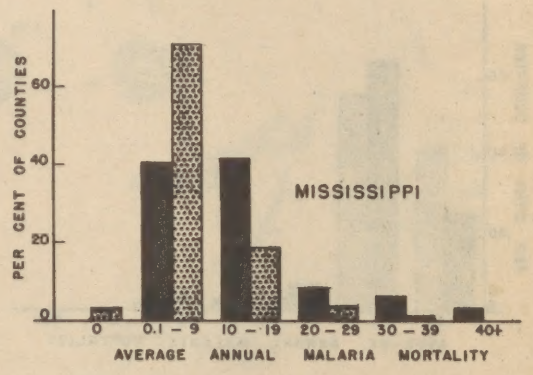
DISTRIBUTION OF COUNTIES IN FIFTEEN STATES ACCORDING TO AVERAGE ANNUAL MALARIA DEATH RATE FOR FIVE YEAR PERIODS

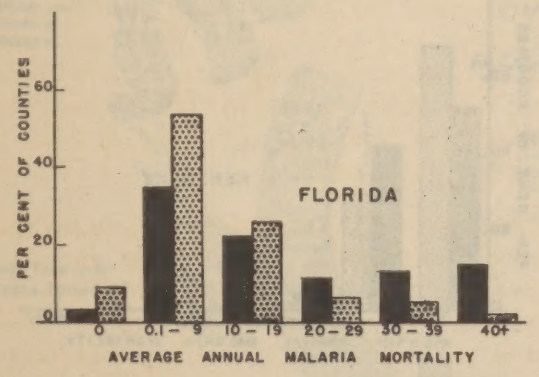
1935 TO 1939 ■ 1938 TO 1942 ▩

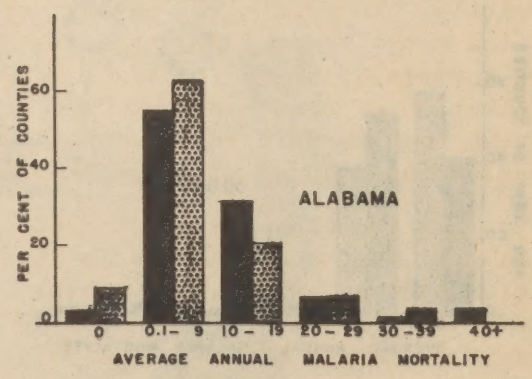


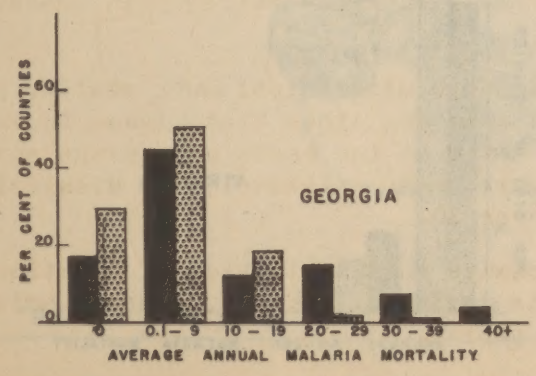


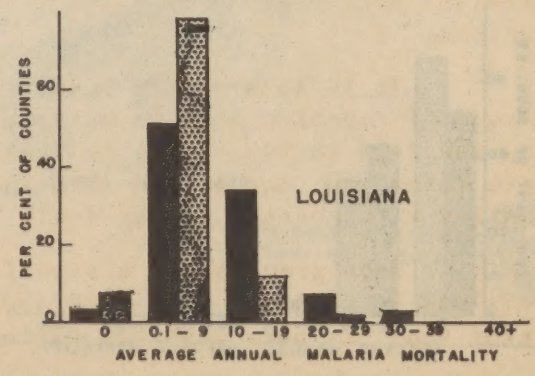






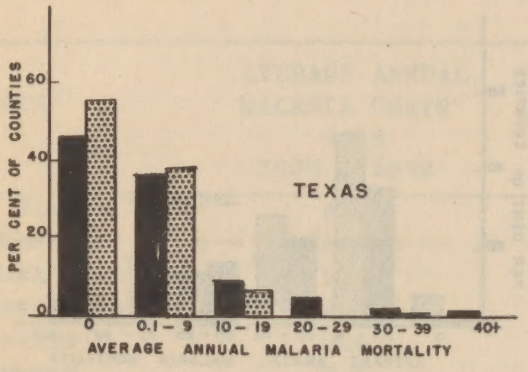


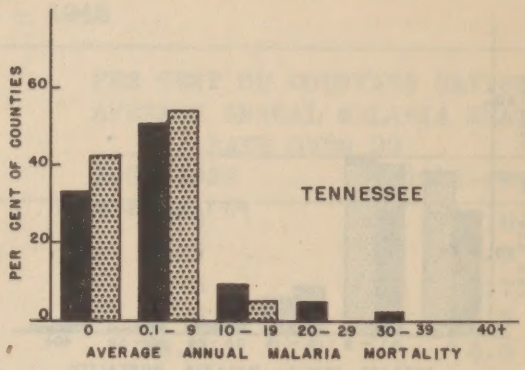


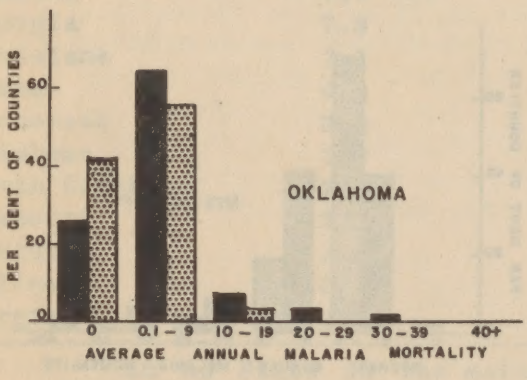


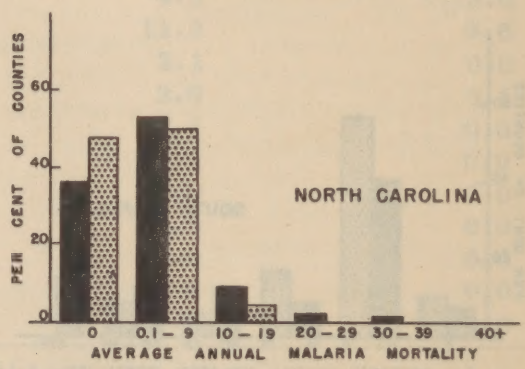
DISTRIBUTION OF COUNTIES IN FIFTEEN STATES ACCORDING TO AVERAGE ANNUAL MALARIA DEATH RATE FOR FIVE YEAR PERIODS

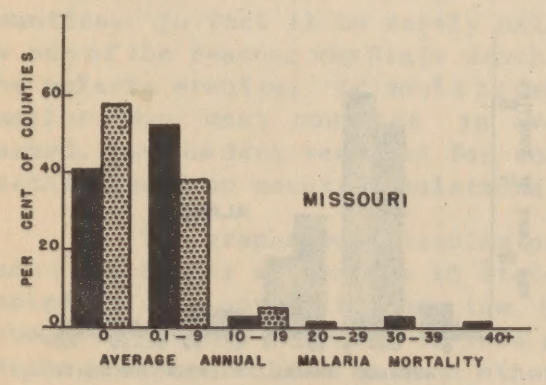
1935 TO 1939 ■ 1938 TO 1942 ▨

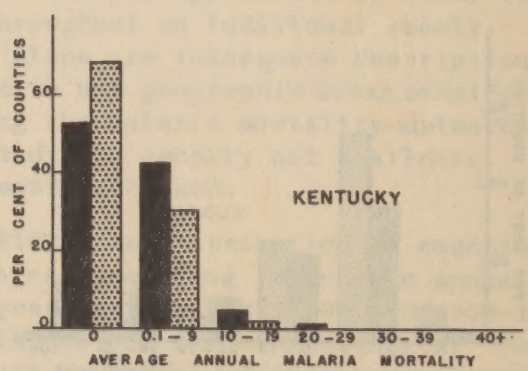


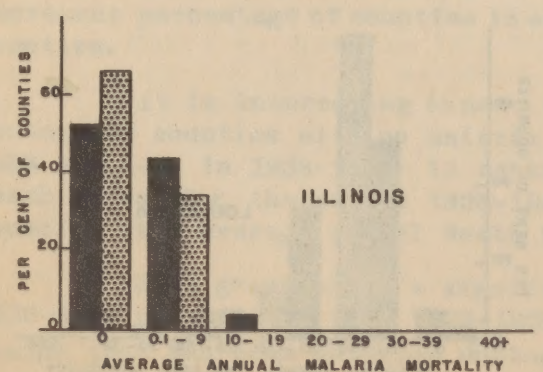


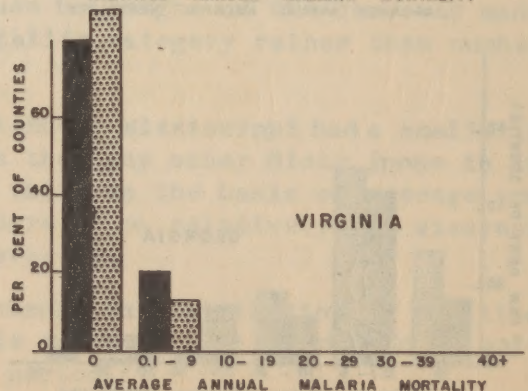




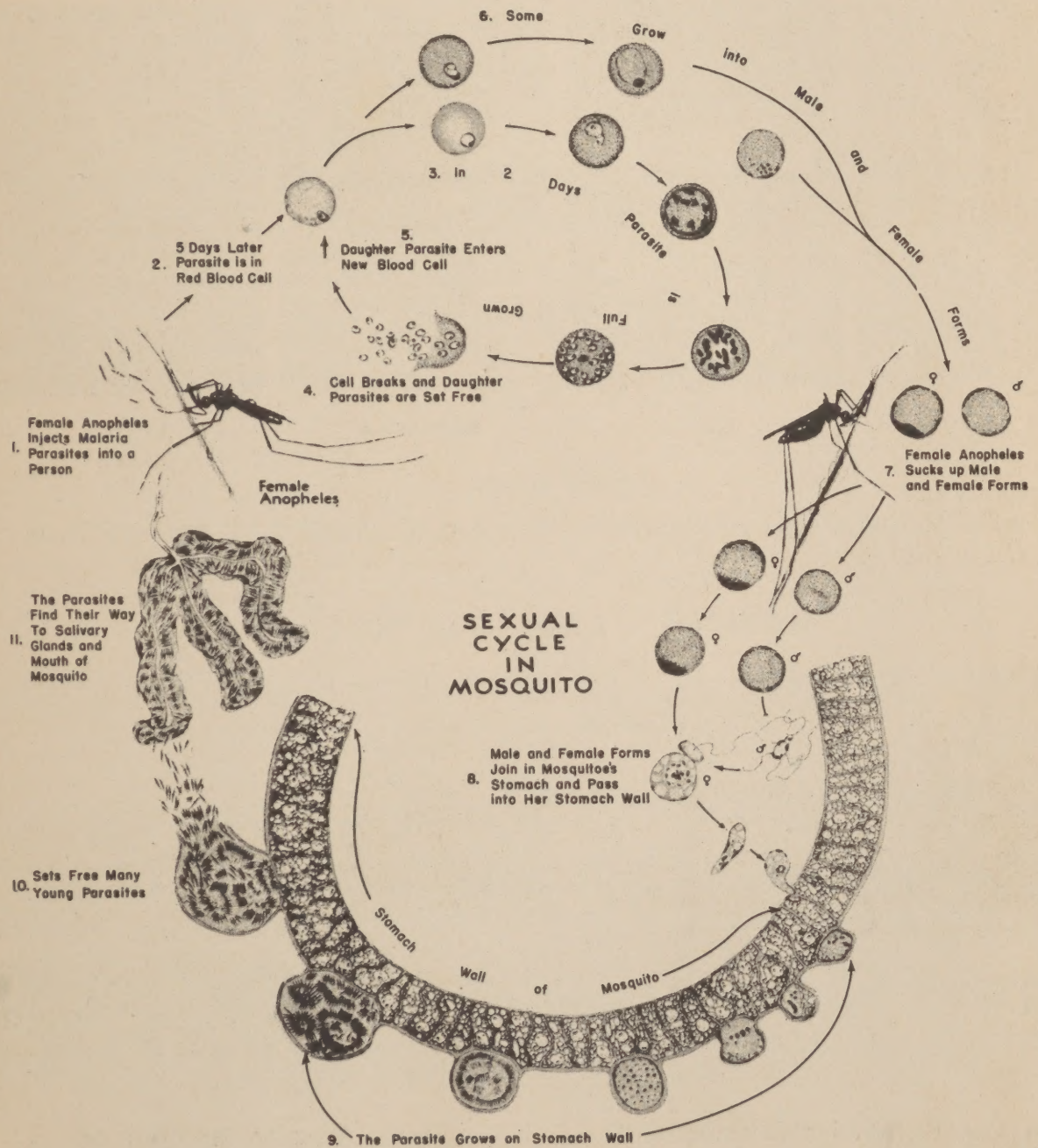








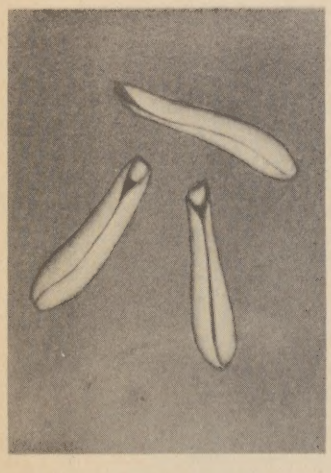
LIFE HISTORY OF THE MALARIA PARASITE (PLASMODIUM VIVAX) IN MAN AND THE ANOPHELES MOSQUITO



Malaria Control in War Areas
U. S. Public Health Service

DOG FLY CONTROL

LIFE HISTORY STAGES OF THE DOG FLY *(Stomoxys calcitrans)*



EGGS

LARVA

PUPARIA

ADULT

Actual Sizes

Egg, 1m.m.; Larva, 20 m.m.; Puparium, 5 to 7 m.m.; Adult 5 1/2 to 7 1/2 m.m.

HABITAT AND CONTROL

The Dog Fly Breeds Principally in Marine Grasses Deposited Along Shore Lines.

A Power Sprayer Mounted on a Barge and Towed By a Shallow Draft Boat is Used in Treating These Grass Deposits.